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## Commentary

## Response to Burns in the Elderly: What is Pathophysiology and What is Physiology?

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The authors [Jeschke et al. \(2015\)](#) have collected an impressive dataset describing pathophysiological reactions to burns in elderly versus adult burn patients. The leading observation was that elderly burn patients experience a higher mortality rate than adults or children. Furthermore, whereas mortality rates were reduced for other age categories, outcome for elderly patients did not improve much over recent years. However, [Lionelli et al. \(2005\)](#) found a reduced mortality in patients over 75 years in a retrospective review between 1972 and 2000 and [Wearn et al. \(2015\)](#) showed in their retrospective review that mortality in the elderly did significantly improve in medium size burns (10–20% TBSA) in recent years.

The reasons for a relatively poor outcome for elderly burn patients remain largely unknown, and therefore, it is difficult to determine areas for improvement of this outcome. This is a reason for concern, since the group of elderly people is increasing, and therefore, it is likely that the group of elderly burn patients will also grow in the years to come. [Jeschke et al. \(2015\)](#) have determined a great number of abnormalities in elderly patients with burns, with respect to metabolic, inflammatory and wound healing characteristics. Clinically, elderly burn patients experienced more pre-morbid conditions and longer hospital stay compared to adults with burns.

The interpretation of these abnormalities, however, is less straightforward. An important question is: Which parameters are related to the burn event, which are a consequence of the elderly age of the patients and which might be related to pre-morbid conditions?

From other literature it is known that more diabetic and prediabetic conditions are present in the elderly ([Somerset et al., 2014](#); [Murphy et al., 2011](#)) and that these conditions were found to be correlated to

higher glucose levels as well as higher mortality post burn injury. However, the level of full thickness burns was higher in these patients. Other literature is non-conclusive on the impact of early glucose control on mortality: some stated that early glucose control in critically ill patients had no effect on mortality ([Shin et al., 2007](#)), while others found that high glucose levels and high glucose variability correlated with increased fatal outcome in trauma patients ([Wahl et al., 2008](#)) and severe burn patients ([Pidcock et al., 2009](#)). The latter authors did not find an effect of age on outcome.

Not much is known on the specific inflammatory response on burn injury specifically in elderly patients. [Jeschke et al. \(2015\)](#) find that in contrast to adult patients, the onset of the inflammatory response in elderly is retarded. This seems to correlate, to some extent, with the reduced cell proliferation and delay in wound healing that was also established, and which is known from other papers as well (see ([Gosain and DiPietro, 2004](#)) for review). Therefore, burn wound healing in elderly might show some similarity to the processes of chronic wound healing, which is also characterized by reduced cell proliferation and altered inflammatory response. Again, a common factor would be the elderly age of the patient rather than the specific disease burden.

Overall burn size and percentage of full thickness burns are generally recognized as important factors which influence outcome in terms of morbidity and mortality, especially in combination with patient age. The definition of Baux scores as a tool to calculate chances of burn survival is based exactly on these criteria ([Douglas et al., 2015](#)). But which factors are of main importance in determining this outcome?

As elderly have a thin skin and the depth of the burn increases in the first 48 h deepening of the burn is likely to be more critical in the elderly than in the adult patient group. It is therefore important to know at what time post burn the depth of the burn was diagnosed. In the patient groups studied by [Jeschke et al. \(2015\)](#), TBSA in total was not different between elderly and adults, but the area of full thickness burns was higher in the elderly group. Deepening of the burns might play an additional role in this and could contribute to higher morbidity and possibly mortality in the elderly patient group.

In conclusion, [Jeschke et al. \(2015\)](#) have found a number of factors that are specifically different in elderly patients with burns versus adult patients with burns. The present study established correlations between poor outcome after burns in elderly patients with a number of abnormalities in metabolic, inflammatory and cellular parameters. However, based on earlier data it is likely that some of these proposed pathophysiological reactions are actually physiological reactions for elderly people in general. Thus, in order to find causal relationships that

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can explain the poor outcome of elderly patients after burns, we need more evidence. Especially, the comparison between elderly with burns to age matched controls seems important here, as the authors rightfully state in their conclusion. This would allow comparison of the metabolic and inflammatory data with respect to pre-morbid conditions.

Clinical implications that could lead to improved outcome after burns for the aged population can only be defined based on this additional and causal evidence that is still lacking today.

## Disclosure

The authors state that there is no Conflict of Interest.

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